REMARKS

It is noted that the Office Action states that the Information Disclosure Statements submitted by applicants on 5/26/04 and 10/25/04 have been considered by the Examiner.

In the Office Action claims 4, 5 and 61 were rejected under 35 USC 112. It is respectfully submitted, that with entry of the above amendment, claims 4, 5 and 61 have been canceled and therefore the rejection is moot.

Claim 61 was rejected under 35 USC 101. It is respectfully submitted, that with entry of the above amendment, claim 61 has been canceled and therefore the rejection is moot.

In the Office Action Claims 1-8 and 57-61 were rejected under 35 USC 102(b) as being anticipated by Takami et al., U.S. 5,753,387. It is respectfully submitted, that with entry of the above amendment, claims 1-8 and 57-61 have been canceled and therefore the rejection is moot.

Claims 9-14 were rejected under 35 USC 103(a) as being unpatentable over Takami et al., U.S. 5,753,387 in view of Hwang et al., U.S. 6,613,480. It is respectfully submitted that with entry of the above amendment, claims 9-14 have been canceled and therefore the rejection is moot.

Claims 1-8, 15-20, 22-24, 31-33, 35-37, 44-46, 48-50 and 57-61 were rejected under 35 USC 103(a) as being unpatentable over Barker et al., U.S. 6,723, 470 ("Barker470") in view of Barker et al., U.S. 5,643,695 ("Baker695"), and further in view of Kobuki et al., U.S. 6,413,679.

The Examiner states that Barker470 teaches a lithium battery comprising a positive electrode, a counter negative electrode, a separator and an electrolyte. The Examiner states that a lithium mixed metal phosphate compound having the formula $LiFe_{1-y}Mg_yPO_4$ is disclosed therein and that $LiFe_{0.9}Mg_{0.1}PO_4$ and $Li_3V_2(PO_4)_3$ are specifically disclosed. Further the Office

Action states that the electrolytes disclosed therein comprise any number of suitable solvents and lithium salts, the solvents including DEC, EMC, EC and PC.

The Examiner states that Barker695 teaches a solvent mixture comprising EC and PC with one or more additional solvents included in the solvent mixture. Such additional solvents may be MEC, DEC or a mixture of MEC and DEC. Neither Barker470 or Barker695 explicitly teaches an example wherein the solvent comprises EC, PC, MEC and DEC.

However, the Examiner states that Kuboki teaches a lithium battery comprising an electrolyte including a lithium salt and a solvent mixture. According to the Office Action the mixed solvent may be EC, MEC, PC and DEC. Therefore, the Office Action states that the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to use the EC, MEC, PC and DEC mixed solvent of Koboki for the electrolyte solvent of Barker470 in view of the teachings by Barker470 and Barker695 that the solvents may be selected from DEC, EMC, EC and PC.

It is respectfully submitted that the claims as amended are not obvious in view of the cited references for the following reasons. Barker470 and Barker695 do specifically disclose the cathode materials claimed in the amended claim. However, as the Examiner correctly states, neither Barker470 nor Barker695 explicitly teaches a four component electrolyte solvent that would necessarily work with such cathode materials. In fact most of the solvent mixtures disclosed are two solvent systems and the preferred solvent systems disclosed therein are two solvent systems.

Koboki teaches cathode materials which are metal oxides. On the otherhand Koboki does not teach or suggest that the electrolytes disclosed therein are useful in combination with cathode active materials other than the oxides disclosed therein.

Applicants respectfully submit that it is not predictable that an electrolyte system used with a specified active material (oxide) will necessarily be useful in combination with other active materials (phosphates). This is because the different active materials may interact differently with an electrolyte solvent system when used together in a cell. There is a distinct difference between the chemical reactivity of oxides and phosphates.

Thus, as stated in the present specification, dimethyl carbonate is commonly used as an electrolyte solvent in lithium ion batteries. However, dimethyl carbonate can react on lithiated carbon anodes to form gaseous by-products. This is problematic in cells, especially in calls with flexible packaging. Therefore, research is continually ongoing to understand such undesired side reactions with cell components. Efforts are made to select the exact solvent/salt electrolyte which is less reactive with cell components while maintaining cell performance. Determining methods to prevent undesired side reactions, especially those involving formation of gas in cells containing lithium metal phosphates. The presently claimed electrolytes are beneficial in that they prevent undesired "gassing" in cells containing lithium metal phosphates while maintaining high conductivity and good chemical and thermal stability.

By way of further example, dimethyl carbonate is commonly used in lithium batteries as a viscosity reducer to enhance conductivity. However, dimethyl carbonate has a low boiling point and can react on lithiated carbon anodes to form gaseous CH_4 and C_2H_6. This can be problematic in cells with flexible packaging in that the gases become trapped in the flexible packaging and with enough gassing the flexible packaging can distort or burst.

On the otherhand, ethyl methyl carbonate is less volatile, is less likely to breakdown and hence is less prone to gassing. However, it has been found that direct substitution of dimethyl carbonates with longer chain carbonates is not successful in all cells in that when such substitution is made cycling performance can be adversely affected. By way of example, substitution of diethyl carbonate for dimethyl carbonate in a lithium ion phosphate cell shows unacceptable capacity fade over cycle life.

It was only through experimentation that the inventors of the invention as claimed discovered that the quaternary solvent electrolytes disclosed herein were useful with the lithium phosphate materials disclosed and claimed. The present inventors found that although substitution of dimethyl carbonates with longer chain carbonates is not always successful as cycling performance can be degraded, that in cells containing the presently claimed lithium phosphates that ethyl methyl carbonate can successfully be used as a substitute for dimethyl carbonate without degrading cycling performance and additionally reduces the "gassing"effect that was occurring in calls containing dimethyl carbonate as an electrolyte solvent for use with the lithium metal phosphates claimed.

It is respectfully submitted in view of the fact that none of the references disclose the use of the currently claimed lithium metal phosphate cathode materials with the quaternary solvent system and in view of the fact that none of the cited references teach or suggest that such quaternary solvent system could be employed with a lithium metal phosphate cathode that the invention as presently claimed would not have been obvious in view of the cited references in combination at the time the invention was made. Therefore, it is respectfully submitted that rejection of the claims remaining in the case under 35 USC 103(a) as being unpatentable over

Barker470, in view of Barker 695 and further in view of Koboki et al. has been overcome and should be withdrawn.

Claims 9-14, 21, 25-30, 34, 38-43, 47 and 51-56 are rejected under 35 USC 103(a) as being unpatentable over Barker et al., U.S. 6,723,470 ("Barker470") in view of Barker et al. U.S. 5,643,695 ("Barker695") in view of Kuboki et al. U.S. 6,413,679 and further in view of Hwang et al. U.S. 6,613,480.

The Office Action cites the two Barker patents and the Kuboki patents as disclosing the same information as set forth in the prior (hereinabove) 35 USC 103 rejection. The Office Action goes on to state that Koboki does not explicitly state the amount of propylene carbonate or diethyl carbonate in the mixed solvent of EC:MEC:PC:DEC disclosed therein. The Examiner relies on Hwang for disclosing amounts of cyclic carbonates.

For all of the reasons stated above applicants believe that claim 15 is allowable over the cited prior art. All of these claims (remaining in the case after amendment) are dependent on Claim 15. Therefore, for all of the foregoing reasons applicants submit that claims 25-30, 34 and 38-43 are not obvious in view of the cited art.

In addition to the reasoning explained above, Hwang et al. disclose electrolytes useful with lithium oxide active materials. Hwang et al. do not teach or suggest that such electrolytes would be useful with phosphate based cathodes. Thus, as with the other references, Hwang alone or in combination with the other references does not make obvious a lithium metal phosphate cell in combination with a quaternary electrolyte solvent. It is therefore respectfully submitted, that the rejection of claims 25-30, 34 and 38-43 under 35 USC 103 has been overcome and should be withdrawn.

It is respectfully submitted that all of the objections and rejections in the Office Action dated November 28, 2007 have been overcome and should be withdrawn. Consideration of the claims remaining in the instant case, as amended, for early allowance is respectfully requested. It is respectfully submitted that all of the claims in the case are allowable and passage of the application and claims to issue is respectfully requested.

The Commissioner for Patents is hereby authorized to charge any fees which may be required for filing of these papers to Deposit Account 220100.

Respectfully submitted,

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